PRICE $2.00

HEATH COMPANY
BENTON HARBOR, MICHIGAN

HEATHKIT®
ASSEMBLY MANUAL

HEATHKIT®

DECADE RESISTANCE KIT
MODEL IN-17

595-872-01

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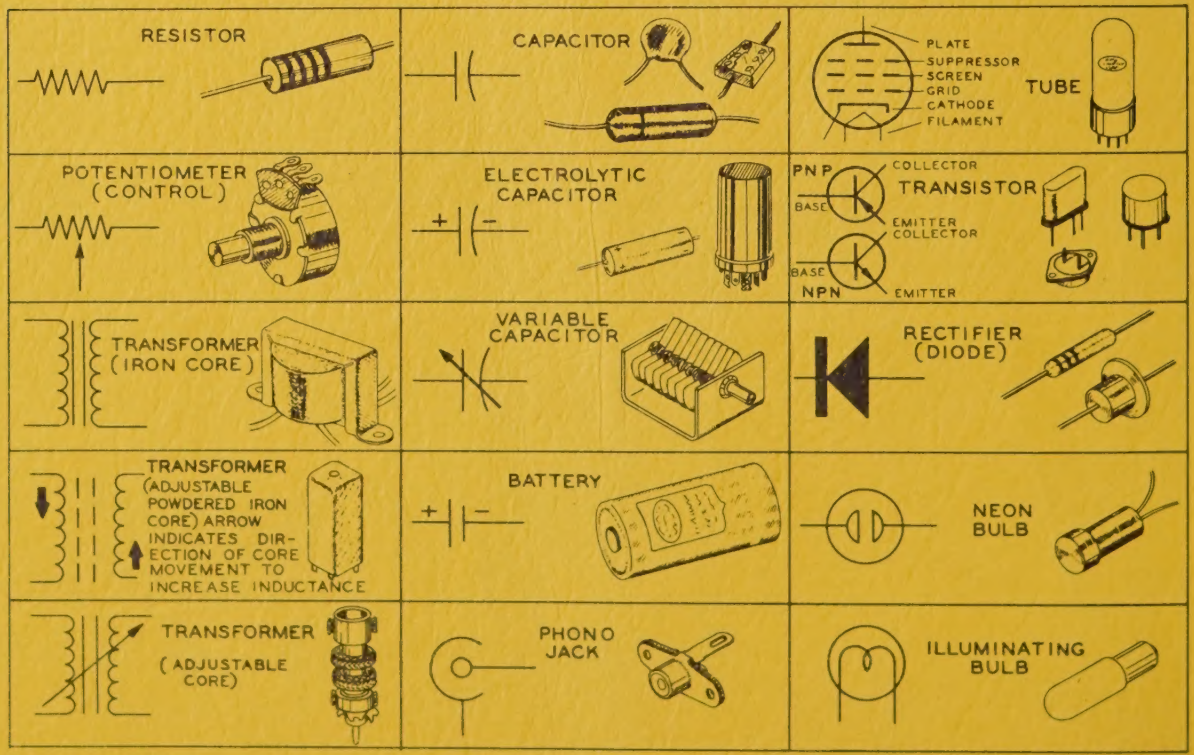
TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations should prove helpful in identifying most parts and reading the schematic diagrams.



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Assembly and Operation

of the

HEATHKIT

DECADE RESISTANCE KIT

MODEL IN-17

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligations to incorporate new features in instruments previously sold.

SPECIFICATIONS

Range. . . . . 1 Ω to 999,999 Ω in 1 Ω steps.

Resistors. . . . . Precision, 1/2% accuracy, 1 watt.

Maximum Current For Each Range. . . . .

	WORKING RATING	MAXIMUM RATING
X1 -	500 ma.	1000 ma.
X10 -	150 ma.	300 ma.
X100-	50 ma.	100 ma.
X1K-	15 ma.	30 ma.
X10K-	5 ma.	10 ma.
X100K-	1.5 ma.	3 ma.

Minimum DC Resistance. . . . . .025 Ω at terminals with all switches set at zero.

Dimensions. . . . . 7-1/2" wide x 5" high x 6-5/8" deep.

Net Weight. . . . . 2-1/2 lbs.

INTRODUCTION

The IN-17 Decade Resistance Kit was designed as an accurate laboratory-type instrument for use wherever electrical measurements involving resistors are made. The wide range of available resistance values makes the IN-17 invaluable as a variable multiplier or shunt, a variable substitution resistor, or as an arm for DC and AC bridges. The Heathkit Decade Capacitance Kit makes an ideal companion with the IN-17 for solving resistance and capacitance networks where a large range of values are necessary.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

CIRCUIT DESCRIPTION

The series arrangement of the range switches and the precision resistors as shown on the Schematic Diagram will yield any resistance value from 1 to 999,999 Ω in 1 Ω steps. Each resistor is rated to be within 1/2% of its ohmic value for precision applications. The 0 position of the range switches allows the resistors to be bypassed if desired. The multiplier printed beneath each range switch on the front panel indicates the value of each resistor for that particular switch. The "shorting-type" switches with make-before-break action permit smooth adjustment of the resistance value without opening or shorting of the circuit.

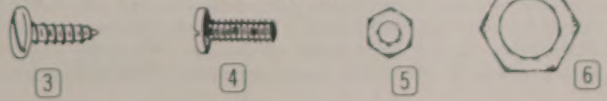
PARTS LIST

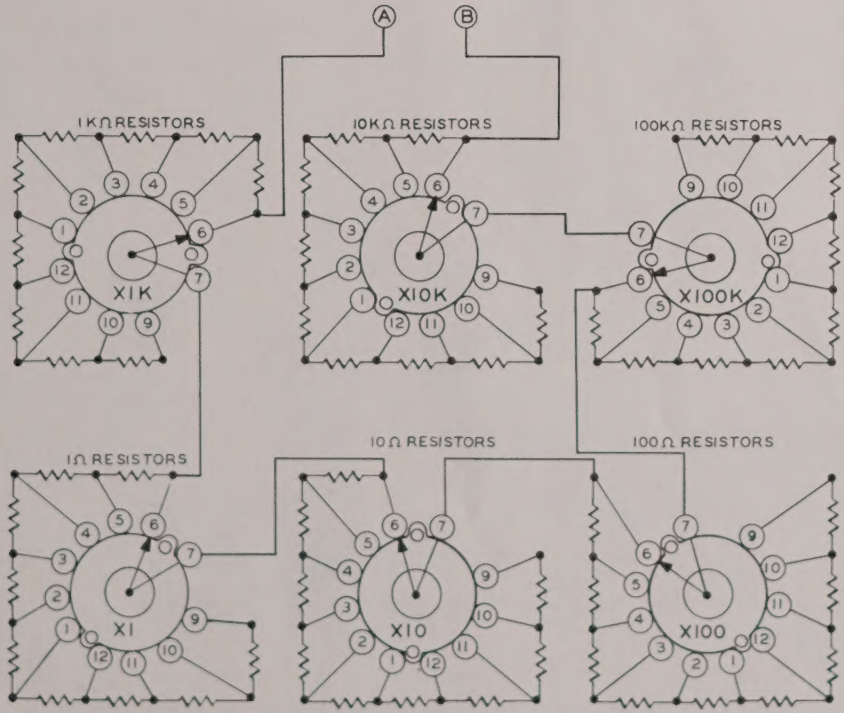
Unpack the kit carefully and check each part against the Parts List. The numbers in front of the Part Number correspond to the picture of that part for quick and positive identification.

To order replacement parts, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS (Precision 1/2% 1 Watt)		
2-46-1	9	1 Ω
2-47-1	9	10 Ω
2-48-1	9	100 Ω
2-49-1	9	1 KΩ
2-50-1	9	10 KΩ
2-51-1	9	100 KΩ

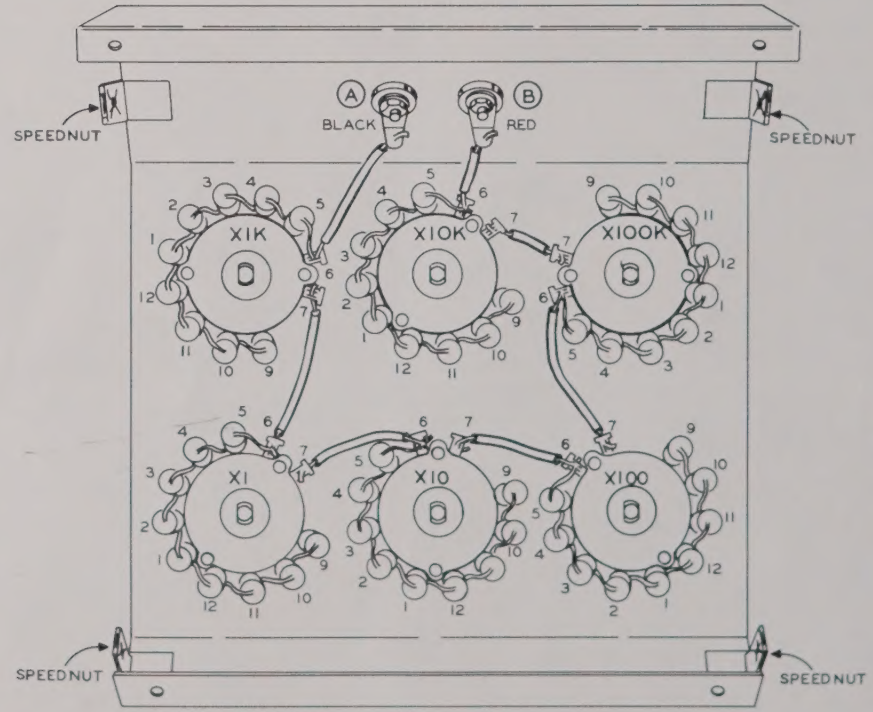
PART No.	PARTS Per Kit	DESCRIPTION
SHEET METAL PARTS		
90-352-2	1	Cabinet shell
100-367-2	1	Front panel
HARDWARE		
[3] 250-8	4	#6 sheet metal screw
[4] 250-89	4	6-32 screw
[5] 252-3	4	6-32 nut
[6] 252-7	6	Control nut





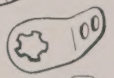
SCHEMATIC OF THE HEATHKIT®

DECADE RESISTANCE KIT MODEL IN-17


SPEEDNUT
SPEEDNUT
A
BLACK
B
RED
X1K
X10K
X100K
X1
X10
X100
SPEEDNUT
SPEEDNUT

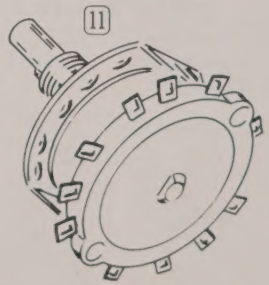
PICTORIAL 1

PART No.	PARTS Per Kit	DESCRIPTION
Hardware (cont'd.)		
252-22	4	Speednut
253-10	6	Control flat washer
254-4	6	Control lockwasher
259-1	2	Solder lug

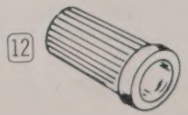


MISCELLANEOUS

63-450	6	Range switch
100-16-2	1	Binding post cap, black
100-16-18	1	Binding post cap, red
427-3	2	Binding post base
75-17	4	Binding post insulator
261-29	4	Rubber foot



PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous (cont'd)		
344-6	1	Length hookup wire
462-245	6	Knob
455-50	6	Knob bushing
391-34	1	Blue and white label
597-260	1	Parts Order Form
597-308	1	Kit Builders Guide
	1	Manual (See front cover for part number)
		Solder



CONSTRUCTION NOTES

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a lead to lug 1 (S 2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered.

Position the work, if possible, so that gravity will help to keep the solder where you want it. The joint to be soldered should be heated with the flat side of the soldering iron tip sufficiently to melt the solder. Apply only enough solder to the heated terminal to thoroughly wet the junction. Remove the solder and then the iron when a smooth soldered junction appears. **Do not move the leads until the solder is solidified.**

ROSIN CORE SOLDER HAS BEEN SUPPLIED WITH THIS KIT. THIS TYPE OF SOLDER MUST BE USED FOR ALL SOLDERING IN THIS KIT. ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE EQUIPMENT IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. IF ADDITIONAL SOLDER IS NEEDED, BE SURE TO PURCHASE ROSIN CORE (60-40 or 50-50 TIN-LEAD CONTENT RADIO TYPE SOLDER.

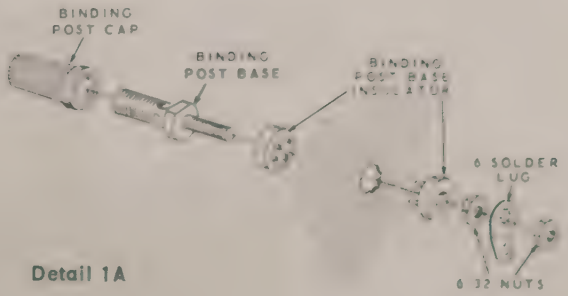
STEP-BY-STEP ASSEMBLY

Refer to Pictorial 1 (fold-out from Page 4) for the following steps.

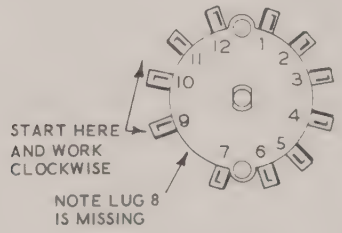
1. Mount binding posts at A and B with black and red caps, respectively. Note solder lug positioning. See Detail 1A for assembly, using the binding post insulators.

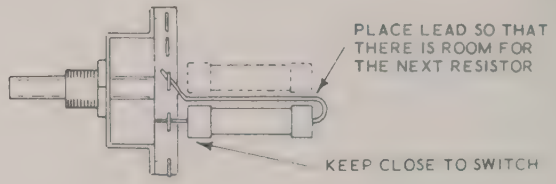
2. Locate all nine 100 KΩ resistors so that they will be readily accessible. (Make sure that all nine of the resistors are 100 KΩ).

3. Position one of the range switches so that a rear view of the switch will correspond to that shown in Detail 1B.



Detail 1A





Detail 1 B

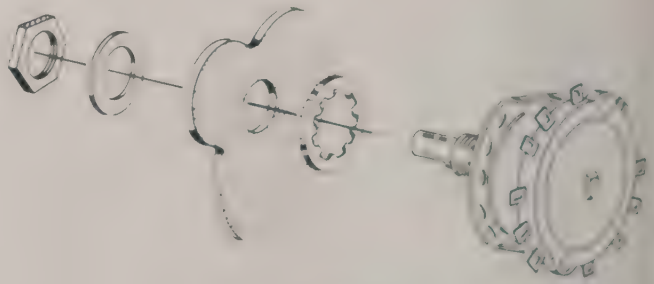
( ) Position one of the 100 KΩ resistors and its leads as suggested in Detail 1B and connect it between lugs 9 (S-1) and 10 (NS).

( ) Install another 100 KΩ resistor between lugs 10 (S-2) and 11 (NS).

( ) In the same manner, install the remaining seven 100 KΩ resistors. Make sure the resistors connected to lugs 12 and 1 do not touch the switch rivet. Do not solder lugs 6 and 7.

( ) Mount and position this switch at the 100 K location shown in Pictorial 1. Use a control lockwasher, control flat washer, and control nut as shown in Detail 1C.

( ) Wire and mount the 10K, 1K, 100, 10 and 1 range switches in the same manner as outlined for the 100K switch. See Pictorial 1 for the proper switch position and location.



Detail 1C

[illegible] 1/4" insulation from each end of the hookup wire to be [illegible] between the following lugs. See Pictorial 1 for proper [illegible].

FROM LUG	TO LUG
[illegible] switch 1K (S-2)	Solder lug of binding post B (S-1).
) 7 of switch 100 K (S-1)	7 of switch 10 K (S-1).
) 7 of switch 100 (S-1)	6 of switch 100 K (S-2).
[illegible] (S-2)	7 of switch 10 (S-1).
) 6 of switch 10 (S-2)	7 of switch 1 (S-1).
) 6 of switch 1 (S-2)	7 of switch 1 K (S-1).
[illegible] of switch 1K (S-2)	Solder lug of binding post A (S-1).

This completes the wiring. Check all the resistors and other wiring for proper solder connections. Make sure each resistor and its lead does not touch the adjacent resistor and its lead.

Detail 1D shows how to keep the binding post caps from falling off. This is done by slightly spreading the open end of the binding posts with a phillips screwdriver after the binding post caps have been screwed on. Tap the screwdriver lightly.

Detail 1D

The knobs supplied with this kit use knob bushings that provide permanent positive action without the use of setscrews.

In the following steps you will install a knob on each of the six switch shafts as shown in Detail 1E. Perform these steps carefully, as a knob bushing cannot be removed from a knob once it is fully inserted.

( ) Push a knob bushing part way onto each of the six switch shafts. Then turn all switch shafts to their full counter-clockwise position.

( ) At one of the switch locations, line up the pointer of a knob with the "0" marking on the panel. Then press the knob slightly onto the knob bushing.

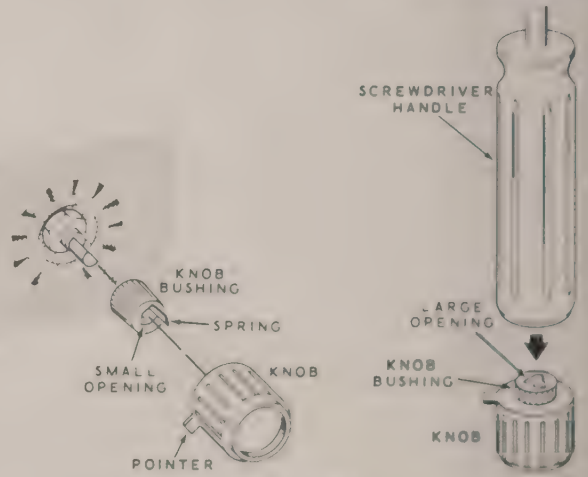
( ) Turn the knob clockwise to each of the switch stop positions. Check to see that the pointer lines up with each panel marking.

NOTE: Perform the next three steps only if the pointer does not line up at each switch marking.

1. ( ) Turn the knob pointer to the mid-position marking on the panel.

2. ( ) Remove the knob from the bushing and turn it slightly to line up the pointer with the mid-position marking.

3. ( ) Press the knob slightly onto the knob bushing. Then turn the knob to each switch position and recheck the pointer alignment. If more than a slight error is noticed at either end position, repeat these three steps.



Detail 1E

( ) Carefully remove the knob bushing and knob together.

( ) Place the knob on a table or other hard surface, then press the knob bushing firmly into the knob. Use a towel or soft cloth on the work surface to avoid scratching the knob.

( ) Press the knob and bushing firmly onto the switch shaft.

( ) Repeat the above steps to install knobs on the remaining switch shafts.

INITIAL OPERATION CHECK

f an ohmmeter is handy, the range switch contacts and the wiring may be checked for proper operation. If you do not have an ohmmeter, proceed to the Final Assembly section. Connect the ohmmeter leads to the red and black binding posts of the IN-17. Set all the range switches in the 0 position. The ohmmeter should read 0. Keep in mind that the measured resistances will vary, depending on the accuracy of your ohmmeter. Now advance the X1 range switch. With the ohmmeter set properly, it should increase by 1 Ω increments. Advance and check the X10 range switch for 10 Ω increments. All of the switches should be checked in this manner. If a short circuit, open circuit, or improper incremental resistance increase is detected as the switches are rotated, it can be remedied very quickly by checking the associated switch circuitry. If necessary, refer to the In Case Of Difficulty section. If operation is as described, you may assume that it is properly constructed.

FINAL ASSEMBLY

) Place a speednut on each of the small L brackets located on each side of the front panel. The flat side of each speednut should face toward the outside of the panel.

) Install a rubber foot at each corner on the bottom of the cabinet shell. First remove the protective backing, then press the foot firmly into place.

( ) Mount the cabinet shell to the front panel, using 6-32 screws on the L brackets and four #6 sheet metal screws on the bottom of the front panel.

( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label onto the inside of the cabinet. Be sure to refer to the numbers on this label in any communications you have with the Heath Company about this kit.

OPERATION

The Decade Resistance Kit is very simple to operate. Just connect it to the circuit under test and adjust the range switches for the particular resistance needed. The total value of resistance is determined by adding the settings of the six range switches. For example: if the range switches were set as follows: The X1 switch at 5, the X10 switch at 7, the X100 switch at 0, the 1K switch at 9, the X10K switch at 1, and the X100K switch at 4, the total resistance presented at the binding posts would be 419,075 Ω or 419.075 KΩ.

CAUTION: Observe the current limitations as outlined in the Specifications. This means the highest range switch in use (not of 0 position) will determine the maximum allowable current

IN CASE OF DIFFICULTY

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.

2. It is interesting to note that about 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered properly.

3. Check the values of the component parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.

4. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring beneath the panel.

5. Repeating the Initial Operation Check procedure may be helpful in pinpointing the problem.

NOTE: In an extreme case where you are unable to resolve difficulty, refer to the Service and Warranty sections of the "Kit Builders Guide" and to the "Factory Repair Service" information on Page 12 of this Manual.

REPLACEMENT PARTS PRICE LIST

PART No.	PRICE Each	DESCRIPTION
RESISTORS (Precision 1/2% 1 Watt)		
2-46-1	.80	1 Ω
2-47-1	.55	10 Ω
2-48-1	.45	100 Ω
2-49-1	.55	1 KΩ
2-50-1	.55	10 KΩ
2-51-1	.45	100 KΩ
SHEET METAL PARTS		
90-352-2	2.20	Cabinet shell
100-367-2	1.65	Front panel
HARDWARE		
250-8	.05	#6 sheet metal screw
250-89	.05	6-32 screw
252-3	.05	6-32 nut
252-7	.05	Control nut
252-22	.05	Speednut
253-10	.05	Control flat washer
254-4	.05	Control lockwasher
259-1	.05	Solder lug

PART No.	PRICE Each	DESCRIPTION
MISCELLANEOUS		
63-450	1.80	Range switch
100-16-2	.10	Binding post cap, black
100-16-18	.10	Binding post cap, red
427-3	.15	Binding post base
75-17	.10	Binding post insulator
261-29	.10	Rubber foot
344-6	.05/ft	Hookup wire
462-245	.60	Knob
455-50	.10	Knob bushing
331-6	.15	Solder
	2.00	Manual (See front cover for part number.)

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from an authorized Service Center or Heathkit Electronic Center to cover local sales tax, postage and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties ad rates of exchange.

To order parts, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to Replacement Parts in the Kit Builders Guide.

FACTORY REPAIR SERVICE

You can return your completed kit to the Heath Company Service Department to have it repaired for a minimum service fee. (Kits that have been modified will not be accepted for repair.) If you wish, you can deliver your kit to a nearby Heath Authorized Service Center. These centers are listed in your Heathkit catalog.

To be eligible for replacement parts under the terms of the warranty, equipment returned for factory repair service, or delivered to a Heath Authorized Service Center, must be accompanied by the invoice or the sales slip, or a copy of either. If you send the original invoice or sales slip, it will be returned to you.

If it is not convenient to deliver your kit to a Heath Authorized Service Center, please ship it to the factory at Benton Harbor, Michigan and follow the following shipping instructions:

Prepare a letter in duplicate, containing the following information:

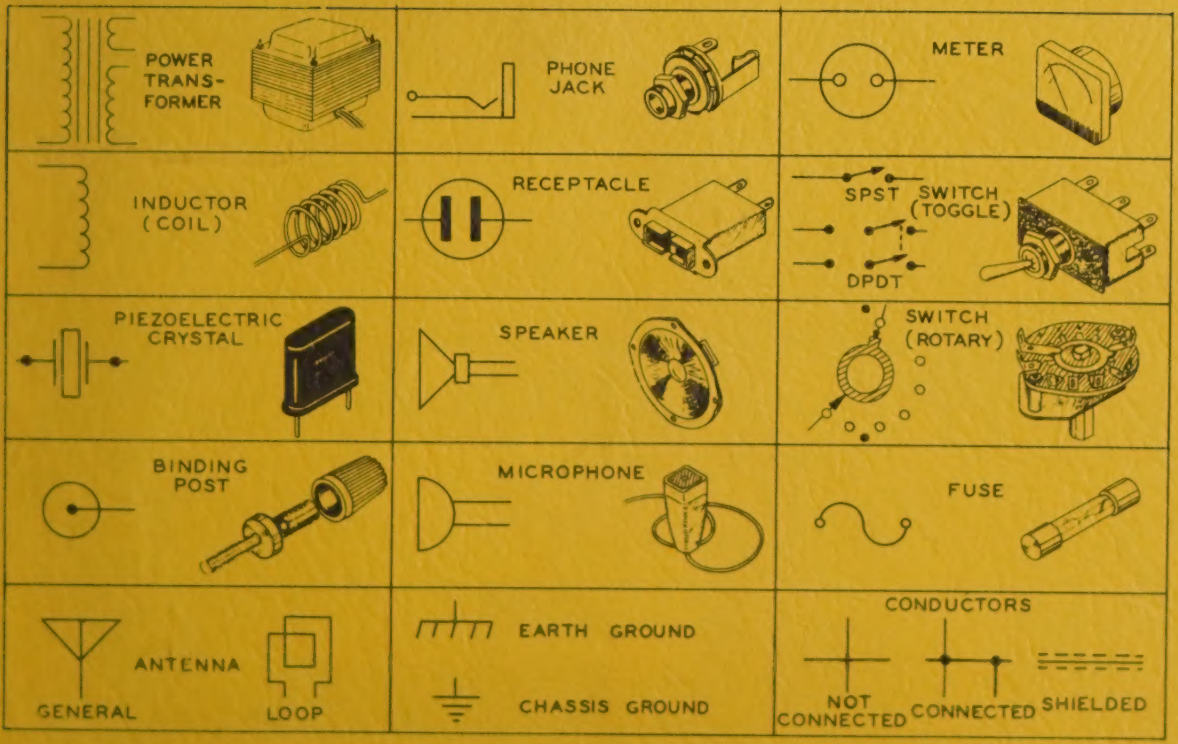
- Your name and return address.
- Date of purchase.
- A brief description of the difficulty.
- The invoice or sales slip, or a copy of either.
- Your authorization to ship the repaired unit back to you C.O.D. for the service and shipping charges, plus the cost of parts not covered by the warranty.

Attach the envelope containing one copy of this letter directly to the unit before packaging, so that we do not overlook this important information. Send the second copy of the letter by separate mail to Heath Company, Attention: Service Department, Benton Harbor, Michigan.

Check the equipment to see that all parts and screws are in place. (Do not include wooden cabinets when shipping receivers, tuners, amplifiers, or TV sets, as these are easily damaged in shipment.) Then, wrap the equipment in heavy paper. Place the equipment in a strong carton, and put at least THREE INCHES of resilient packing material (shredded paper, excelsior, etc.) on all sides, between the equipment and the carton. Seal the carton with gummed paper tape, and tie it with a strong cord. Ship it by prepaid express, United Parcel Service, or insured parcel post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

TYPICAL COMPONENT TYPES



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